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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/724,029	11/26/2003	Alexei A. Erchak	16459-010001	7272
26161	7590	11/19/2004	EXAMINER HODGES, MATTHEW P	
FISH & RICHARDSON PC 225 FRANKLIN ST BOSTON, MA 02110			ART UNIT 2879	PAPER NUMBER

DATE MAILED: 11/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/724,029

Applicant(s)

ERCHAK ET AL.

Examiner

Matt P Hodges

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 7-21 and 24-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 7, 9-21, 24-31, 34 and 35 is/are rejected.
- 7) ☒ Claim(s) 18, 32, 33 and 36 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 8/30/2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The Amendment, filed on 8/30/2004, has been entered and acknowledged by the Examiner.

Cancellation of claims 5, 6, 22, and 23 has been entered

Specification

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 7, 12-15, and 19-21, 24-29 are rejected under 35 U.S.C. 102(b) as being anticipated by Rastani (US 5,073,041).

Regarding claims 1 and 2, Rastani discloses (see figure 2) a light emitting device including a multi-layer stack of materials further including a light generating region (10), and a first layer (22) supported by the light generating region, and a support (18). The first layer includes the pattern of holes (21) which serves to collimate or focus the light emitted by the

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active region. Further the light emitted is collimated such that the divergence of the beam edges is less than 11 degrees, thus the majority of the light emerges within 30 degrees of an angle normal to the surface of the device and is more collimated than a Lambertian distribution of light. (Column 3 lines 35-45).

Regarding claims 3-4, the filling factor of the pattern formed on the first surface is found by calculating the voids according to the formula on Column 4 line 60 of the specification. In the case for the situation of 10 rings (Column 3 line 49) the filling factor is calculated to be 51.4%.

Regarding claim 7, Rastani further discloses (see figure 2) a reflective layer (14) located between the support and the light-emitting layer. Though not specifically stated the reflective layer would necessarily have a reflectance of at least 50% in order for the device to properly lase.

Regarding claim 12, Rastani further discloses (see figure 2) a current spreading layer (20) between the first layer (22) and the light-emitting layer.

Regarding claims 13 and 14, Rastani further discloses (see figure 2) electrical contacts (16) configured to vertically inject current into the device.

Regarding claim 15, the device as disclosed by Rastani is a laser.

Regarding claims 19 and 20, when the pattern is formed directly onto the bottom of the first layer, the pattern does not extend into the light-generating region or beyond the first layer. (See figure 2).

Regarding claim 21, when the pattern is formed by a separate layer (see figure 6) formed on the middle layer (22) which lies between the first layer and the current spreading layer, the pattern does extend beyond the first layer.

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Regarding claim 24, the Fresnel rings disclosed by Rastani are a complex periodic pattern.

Regarding claims 25-27, Rastani discloses the use of substrate or wafer composed of an array of light emitting devices as described in the rejection of claim 1 above. Further the array is formed at a density of 100 devices per centimeter. (Column 2 lines 27-34).

Regarding claims 28 and 29, the rings are formed with a depth of about $\lambda/5$. (Column 3 lines 55-65).

Regarding claim 30, Rastani further discloses (see figure 4) a pattern where the circles are offset to focus the beam off center. This pattern is therefore not periodic.

Regarding claim 31, the dielectric function is at least partially a function of the depth of the dielectric; therefore where there is a whole the dielectric function is greatly reduced and thus varies according to a complex periodic pattern.

Regarding claim 34, claim 34 is rejected for the same reasons as recited in the rejection of claim 30.

Regarding claim 35, claim 35 is rejected for the same reasons as recited in the rejection of claim 24.

Claims 1, 7, 10, 11 and 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Lear (US 5,633,527).

Regarding claim 1, Lear discloses (see figure 6) a light emitting device including a multi-layer stack of materials further including a substrate support (12), a light generating region (42), and a first layer (14) supported by the light generating region. The first layer includes a pattern

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made of progressively larger holes which serves to collimate or focus the light emitted by the active region. (Column 13 lines 25-35).

Regarding claims 7, Lear further discloses (see figure 7) a reflective mirror (62) formed between the light emitting region and a substrate support (12). The mirror has a reflectivity of at least 90%. (Column 16 lines 18-30).

Regarding claims 10 and 11, the device is alternatively formed on a heat sink which has a vertical heat gradient moving heat away from the light emitting device. (Column 20 lines 1-5).

Regarding claims 15-17, the device is a Light Emitting Diode (LED) formed flat on a wafer. (Column 13 lines 5-10).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lear. (US 5,633,527).

Regarding claims 8 and 9, Lear discloses the device as claimed (see rejection of claims 1, 6 and 7 above) but does not appear to specifically disclose the use of a mirror material that acts as a heat sink. However Lear does disclose the use of a heat sink at the bottom of the device and thus the vertical propagation of heat from the light-emitting region, through the mirror and support, and to the heat sink at the bottom of the device. Since heat is transferred through the

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mirror is would be advantageous to select a mirror material that is both reflective and highly heat conductive. It has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. Specifically in this case, it would have been obvious to one having ordinary skills in the art at the time the invention was made, since the selection of known materials for a known purpose is within the skill of the art, to have used a heat sink material of high reflectivity such as silver for use in the mirror as disclosed by Lear in order to improve heat conductivity of the mirror while maintaining optimum reflectivity.

Allowable Subject Matter

Claims 18, 32, 33, and 36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 18, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 18, and specifically comprising the limitation a light emitting device including a support, light generating region, and a first layer, where the first layer has a pattern of holes that is configured to collimate the light more than a Lambertian distribution. Further the pattern has an ideal lattice constant and a detuning parameter with a value greater than zero.

Regarding claim 32, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 32, and specifically comprising the limitation

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a light emitting device including a support, light generating region, and a first layer, where the first layer has a pattern of holes that is configured to collimate the light more than a Lambertian distribution. Further the dielectric function of the first layer varies spatially according to a quasicrystalline pattern.

Regarding claim 33, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 33, and specifically comprising the limitation of light emitting devices where each device includes a support, a light generating region, and a first layer, where the first layer has a pattern of holes that is configured to collimate the light more than a Lambertian distribution. Further the pattern has an ideal lattice constant and a detuning parameter with a value greater than zero.

Regarding claim 33, the references of the Prior Art of record fails to teach or suggest the combination of the limitations as set forth in claim 33, and specifically comprising the limitation of light emitting devices where each device includes a support, a light generating region, and a first layer, where the first layer has a pattern of holes that is configured to collimate the light more than a Lambertian distribution. Further the dielectric function of the first layer varies spatially according to a quasicrystalline pattern.

Response to Arguments

Applicant's arguments with respect to claims 1 and 25 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Monto (US 5,363,009) discloses the use of a patterned surface on a light-emitting device in order to collimate the emitted light.

Vakhshoori (US 5,426,657) discloses the use of a Fresnel mirror formed on a Laser diode.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.


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Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matt P Hodges whose telephone number is (571) 272-2454. The examiner can normally be reached on 7:30 AM to 4:00 PM M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

mph 

Joseph Williams
